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**Tajweed: An Expert System for Holy Qur'an Recitation Proficiency****Musbah J. Aqel<sup>a</sup>, Nida M. Zaitoun<sup>b</sup> \***<sup>a</sup>Department of Computer Science, Faculty of Information Technology, Applied Science University, Amman, Jordan<sup>b</sup>Department of Computer Science, Faculty of Information Technology, Applied Science University, Amman, Jordan**Abstract**

An expert system for the holy Qur'an recitation proficiency is developed to help non Arabic Muslims to recite the holy Qur'an according to the Islam's rule. The system was developed as a rule-based system and implemented using Prolog language. The system was tested by experts in Tajweed and the results were very excellent.

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*Keywords:*

**1. Introduction**

Expert systems are computer applications [4] or a programming approach [5] which embodies some non-algorithmic expertise for solving certain types of problems [4] by providing answers for complicated problem [5]. The applications of expert systems are rapidly increasing. Such applications are very effective in situations when the domain expert is not available. Expert systems found many applications in many fields, like science, business, medicine, and social area [12].

Expert systems tools are valuable because they provide rich software development environments, and the knowledge representation and the inference engine are already built into them. KHABEER is an Arabic CLIPS-based expert system tool where all the commands and syntax are written in Arabic [6]. KHABEER was developed using the conventional language C. KHABEER uses rules as its primary knowledge representation approach and supports a rich pattern-matching language for specifying rule conditions. The system has interface that supports pull-down menus [6].

Tajweed of the Holy Qur'an is the knowledge and application of the rules of recitation so the reading of the

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Qur'an is as the Prophet Mohammed peace and blessings are upon him, recited [1], [2], [3]. The word "**Tajweed**" means to improve, make better [2], [3], betterment [1]. It is one of the most honoured of sciences and one of the best of them due to its relation to Allah's words [1]. Applied definition of Tajweed is articulating every letter from its articulation point and giving the letter its rights and dues of characteristics [1]. It is preserving the tongue from mistakes in pronunciation of the Glorious Qur'an during reading [1]. One who wishes to learn a Tajweed needs to understand and well practice its several principles [1], [2].

The rule setter from the practical point of view is the Messenger of Allah the Prophet Mohammed peace and blessings be upon him, because the Qur'an was revealed to him from Allah, The most high [1].

The knowledge of Tajweed is contingent on four matters:

- a. Knowledge of the articulation points of the letters.
- b. Knowledge of the characteristics of the letters.
- c. Knowledge of what rules change in the letters due to the order of letters.
- d. Exercising the tongue and a lot of repetition. [1]

## 2. Tajweed Rules

The rules of tajweed are classified as follows:

**I. Noon and Meem Mushaddad** is that noon or meem which has a shaddah with Ghunnah of 2 beats.

**II. Al-Qalqalah** is vibration the sound at the end of the pronunciation of any letter of Qaaf, Ttaa, Baa, Jiim or Daal, when it is Saakin; with sukoon or shaddah.

### III. Noon saakinah and Tanween Rules

**Noon Saakinah** is the noon with no Harakah or with a Sukoon.

**Tanween** is a noon Saakinah at the end of the nouns is pronounced as Noon Saakinah without writing noon.

### IV. Meem Saakinah Rules

**Meem Saakin** is the meem with no Harakah or with a Sukoon sign on it.

#### Rules of Meem Saakinah

- a. **Ikhfaa Shafawi:** Hiding meem by the Baa with the two lips are not completely contact with 2 beats Ghunnah.
- b. **Idghaam Shafawi:** Mixing of a saakin Meem into a Mutaharrik Meem following it with 2 beats Ghunnah.
- c. **Izhaar Shafawi:** Clear Meem Saakinah with a complete contact of the two lips when it is followed by any letter other than Baa and Meem.

### I. Al-Madd Rules

**Al-Madd** means long, to make the Madd letters long under some conditions from two to six beats depending upon its kind.

Madd letters:

Leen letters both are preceded by a letter with a Fathah

- i. Yaa Saakinah.
- ii. Waaw Saakinah.
- b. Huroof Maddiyyah each is preceded by a letter with a likely haraka
  - i. Alif saakinah preceded by a Fathah.
  - ii. Waaw Saakinah preceded by a Dhammah.
  - iii. Yaa Saakinah preceded by a Kasrah.

The complete model for the Qur'an tajweed rules are shown in fig. 1.

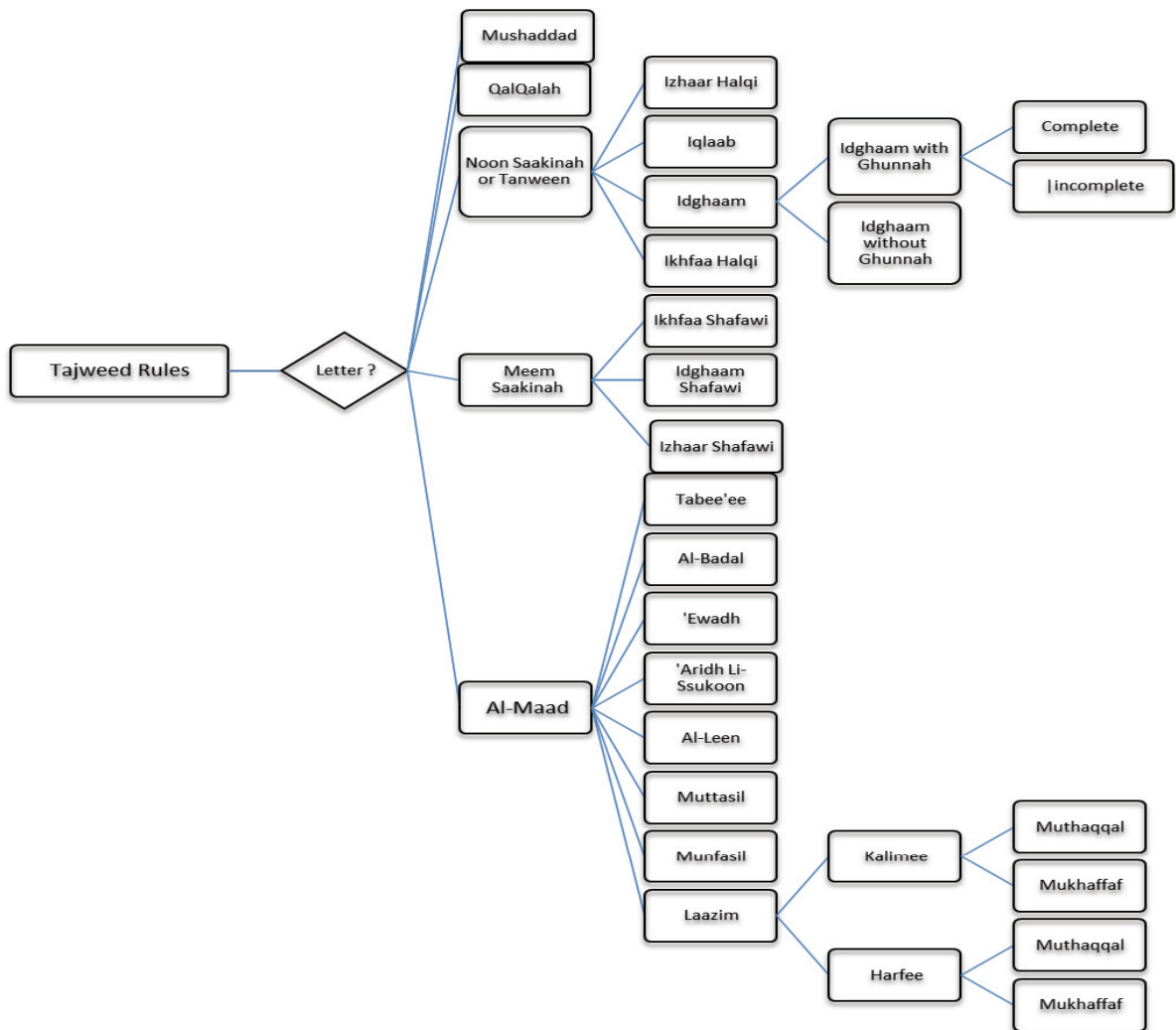


Figure (1): A model for Tajweed rules

### 3. Tajweed Expert System Design

The expert system consists of four components and the process of development as shown in Figure 2. These components are as follows:

- Inference Engine: The core of the system, which obtains the solution for a particular problem from the knowledge Base and data in working storage.
- User Interface: The interface is designed as a set of windows and menus to facilitate the interaction between the user and the system in order to make the system easy-to-use.
- Explanations: the ability of the system to explain the reasoning process that it used to reach a conclusion and a recommendation.
- Knowledge Base: consists of rules and facts that are acquired from domain experts. This knowledge is represented as a set of rules in the form of IF THEN. For example:

**IF (Noon or Meem has a shaddah) then**

The rule is Mushaddad

**IF (Q aaf, Ttaa, Baa, Jiim or Daal is saakin) then**

The rule is Qalqalah

**IF (Noon Saakinah is followed by Hamza, Haa, hhaa, Aiin, Khaa or Ghaiin) then**

Then the rule is Izhaar

**IF (Noon Saakinah is followed by Baa) then**

Then the rule is Iqlaab

**IF (Noon Saakinah is followed by Yaa or Waaw) then**

Then the rule is **In Complete Idghaam with**

**Ghunnah**

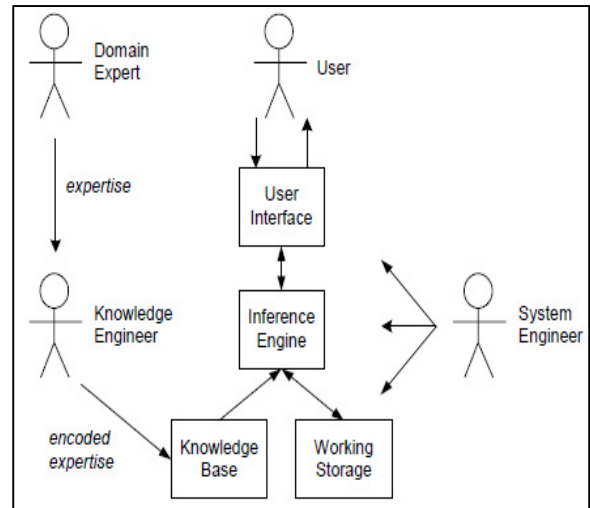


Figure (2) Proposed expert system components

**IF (Noon Saakinah is followed by Noon or Meem) then**

Then the rule is **Complete Idghaamwith Ghunnah**

**IF (Noon Saakinah is followed by Raa or Laam) then**

Then the rule is **Complete Idghaam without Ghunnah**

**IF (Noon Saakinah is followed by Baa) then**

Then the rule is Iqlaab

### 4. Expert System Results

Assume a user would like to consult the expert system for the proper recitation of a phrase of a holy Quran (Aya). The system starts by asking some questions regarding to word of the phrase, and each two successive letters of this word and the user will answer as follows:

Is the letter Noon or Miim Mushashaddad (y/n) ? no

Is the letter non saakinah or tanween (y/n) ? n

Is the letter miim saakinah (y/n) y

Is the letter follows the mii saakinah miim (y/n) y

Then the system will conclude that the correct recitation for this word is by making IDGHAAM Shafawi for the two Miim letters as shown in Figure 3.

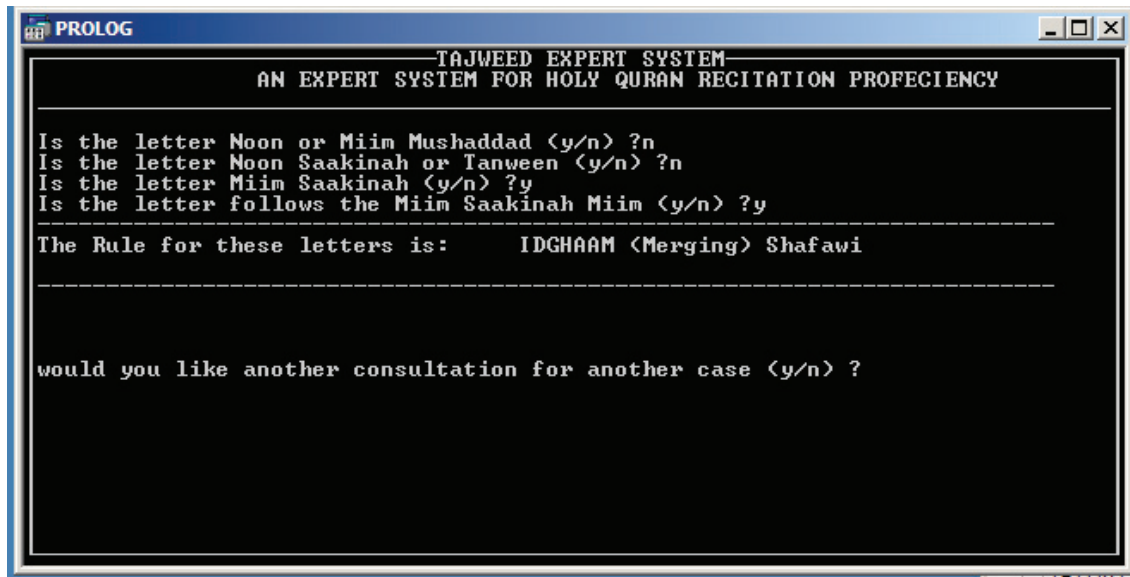


Figure 3: A consultation session with Tajweed expert system

## 5. Conclusion

An expert system was developed for proper recitation of holy Qur'an which is called Tajweed rules. The expert system was designed and implemented as a rule-based system. The system was tested and evaluated by experts in the field of Tajweed and they results were very excellent since the system could provide the proper recitation for any word in holy Qur'an. This is very useful for non-Arab Muslims and for the Arab students who are studying at the universities the holy Qur'an Tajweed rules.

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